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Report

Vessel Disposition Technique in Kidney Transplantation: Long-term Follow-up at Cho Ray Hospital, Vietnam

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Abstract: In this clinical serial, we would like to introduce a surgical technique for kidney transplantation (KTx) from living donor (LD); we call the vessel disposition technique (VDT), with long-term follow-up results. A prospective study at Cho Ray Hospital. The patients underwent the KTx from 1998-2011 and following-up until 2016. There were 201pts., 130 males (64.7%) and 71 females (35.3%). Average age is 33.56 ± 8.62 year old (yo), [15 to 61yo]. We divided it into two groups (at the back table and recipient surgical table): Group A: The Kidney graft (KG) with short vein (≤20 mm) was transplanted on right iliac fossa: 63/201pts. (31.34%), 13/63 from the left (20.63%) and 50/63 from the right (79.37%): the renal vein was dissected, liberated and prolonged; for the right KG, a renal VDT would be done. On the pts., right Gibson incision, made an iliac VDT: dissection of the right iliac vessels (RIV), moved the external iliac vein (IV) to the right side of the external iliac artery; and a termino-lateral venous anastomosis. The renal artery anastomosis would be done as usual. Group B: The KG with the long vein enough (>20 mm) was also transplanted on RIF: 138/201pts (68.66%). Usually, the KG is the left, the KTx was performing as usual, vascular postoperative follow-up by Doppler ultrasound. There wasn't any surgical vascular complication during the average FU of: 8.0±3.44 years (group A) and 8.79±4.07 years (group B). During the long time follow-up on the serial, the VDT was satisfactory. The KTx from LD was safety for the short KG vein and we could perform on the right side of the pts for the left and the right KG. We could avoid other risky venous reconstructive techniques.

Keywords: Vascular Reconstruction in Kidney Transplantation, Kidney Transplantation Techniques, Vessel Disposition Technique, Transposition of Iliac Vessels, Renal Vein Extension, Laparoscopic Living-Donor Nephrectomy

1. Introduction

There are 2 problems for the surgical technique in KTx: (1) traditionally, the left KG will be transplanted in the RIF and the right KG will be in the LIF, but KTx become difficult and more risky if KG vein is short; (2) There are currently some suggestions as solution for surgical techniques, there current available techniques may be reconstruction for venous extension of the KG [1-6], or iliac vessel (IV) transposition [7, 8]. The ESRD patients were listed on the kidney transplant protocol of Cho Ray Hospital. We have evaluated to apply the VDT for KG at the back table and the recipient theater. There were many reports about the topic [9-15], in Viet Nam and other international meetings. The study were homogeneous because only one group performed during the study period, we would like to introduce our experience for these problems with the VDT, on the recipients and on the KG. The report is results of study on VDT for long-term follow-up.

2. Methods

A prospective study at the Department of Urology, Cho Ray Hospital, Vietnam. The recipients were divided into 2 groups:

Group A: The KG with the short vein (≤20 mm), would be transplanted on RIF.

On the KG: the renal vein was meticulously dissected to liberate and to prolong it but never cut any venous branch; if it was the right KG, renal VDT would be done (figure 1).

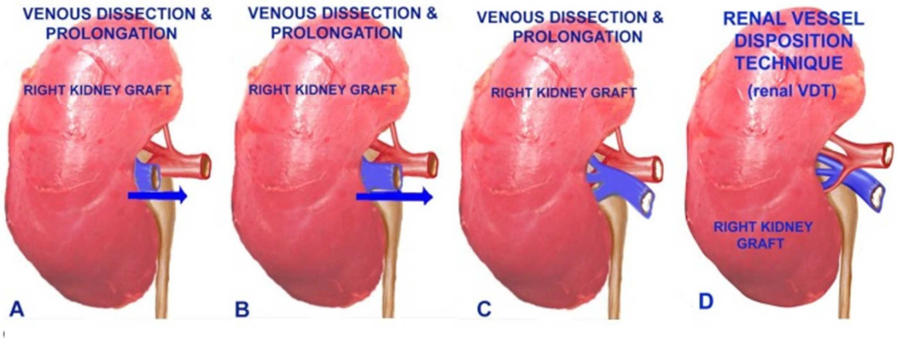

Figure 1. *The VDT on right KG with short vein: A, B, C: meticulous Hilary dissection, D: venous prolongation.*

On the pts: the right Gibson incision was made and the iliac VDT would be done: the RIV and the RIA were dissected, venous branches were ligated and cut, then the external RIV was moved to the right side of the external RIA; then the termino-lateral venous anastomosis would be done, continuous suture by Prolene 6 or 7.0 (figure 2).

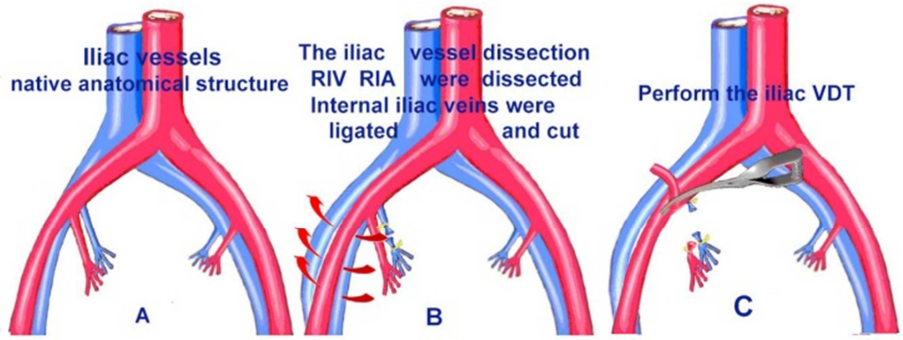

Figure 2. *The iliac VDT on RIF. A: native anatomical structure of the IV. B: IVD, C: perform the iliac VDT.*

For the arteries: a termino-terminal anastomosis was done for the renal artery with the internal RIA, continuous suture by Prolene 5, 6 or 7.0 (figure 3).

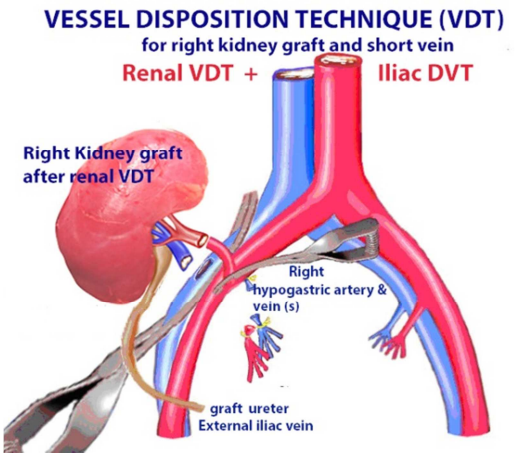

Figure 3. *Right KG transplated at right IF after applied three steps of VDT for right KG, and combine of two techniques for iliac DVT. Then the right KG vein was anastomosed with the external RIV and right KG artery was anastomosed with the internal RIA.*

If there were multiple renal arteries, the internal RIA would be dissected with multiple branches; a termino-lateral anastomosis with the common iliac artery will be chosen if there was one of the internal iliac arteries were occluded.

Group B: The KG with the long vein enough (>20 mm) was also transplanted on RIF. On the KG, the renal vein wasn't needed dissection. The termino-lateral venous anastomosis would be done; the renal vein is located on the RIA. The arterial anastomosis was the same as above (figure 4).

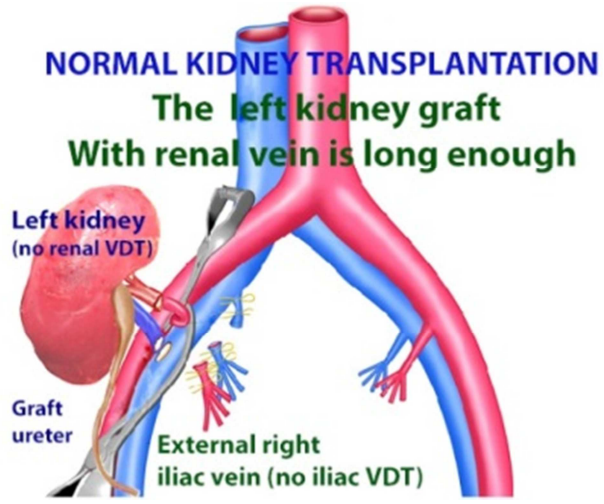

Figure 4. *The left KG, renal vein is long enough. Neither of renal vein nor iliac need VDT.*

The graft ureter was implanted by the modified Lich-Gregoir technique (ureteral stenting with the 6 or 7Fr double J catheter, remove after 1 or 2 week) and a urethral Foley catheter, 18 or 20 Fr, remove after 5-7 days. Usually, there were 2 retroperitoneal drains before the abdominal closing (by resorbable suture 2.0). Preoperative criteria of the patients, the immunological matching of donor- recipient were done as normal procedure of KTx. The postoperative follow-up (FU) and treatment which were as the normal procedure in KTx, it is including the convention immunosuppressive regimens. A special FU for the vessel blood perfusion by Doppler ultrasound [16-18] is every 3 months in the 1st year, then every year. The CT scan angiography if necessary.

3. Results

The patient characteristics

Total number of pts was 201 pts.

They underwent the KTx due to ESRD (on HD or CAPD), there were 2 cases were operated before on periodic hemodialysis (table 1).

Table 1. *Patient characteristics and patients groups.*

	pts	males	females	average (yo)	range (yo)
Total recipients (pts)	201	130 (64.7%)	71 (35.3%)	33.45 ± 8.77	[15 to 61]
Group A: pts with short vein (≤20 mm)	63/ 201 (31.34%)	42 (66.67%)	21 (33.33%)	34.98 ± 8.27	[17 to 53]
Side of kidney graft	13/63 left KG (20.63%)	50/63 right KG (79.37%).			
Group B: pts with long vein (>20 mm)	138/201 (68.66%)	88 (63.74%)	50 (36.23%)	32.82±8.75	[15 to 61]
Side of kidney graft	138 /201 (68.66%)	138/138 left KG (100.0%)	0/138 Right KG (0.00%)		

Donor characteristics

There were 201 living donors, almost were related (196 donors, 97.51%), 5 donors (2.49%) were not related but they had proven no commercial organ (table 2).

Table 2. *Living donor characteristics and method of kidney retrieval.*

Donor characteristics	Total donors	% (n=201)	notes
Total donors	201	-	volunteer
Related	196 /201	97.51%	Non-commercial
Non related	5/201	2.49%	Non-commercial
Open retroperitoneal nephrectomy	75	37.0%	1998-2004
Transperitoneal or Retroperitoneal laparoscopic Nephrectomy	126	52.7%	2004-2011

Renal vein length was measured (table 3). If it was shorter than 20mm will be distributed to group A, and the longer than 20mm would be distributed to group B.

Table 3. *The average of renal venous lengths.*

The length of renal vein	Group A (n=63)	Group B (n=138)
Average length of renal vein (mm)	7.36 ± 2.37	20.45 ± 4.28
Maximal length (mm)	15	40
Minimal length (mm)	4	15

Table 4. *Distribution of KGs retrieval by laparoscopic or open nephrectomy for 2 groups.*

	Open retroperitoneal nephrectomy	Transperitoneal or Retroperitoneal laparoscopic nephrectomy	Total pts	% (n=201)
Group A (n=63)	13	50	63	31.3
Group B (n=138)	62	76	138	68.7
Total	75	126	201	100.0
% rate (n=201)	37.3	52.7	100.0	

Note: there were 13 left KG but short veins due to iatrogenesis (9 laparoscopic and 4 open).

Short renal vein management: venous prolongation and renal VDT.

Meticulous dissection on KG hilium (without section any vein or artery branch. This technique to achieve two objectives:

1. Venous prolongation
2. Renal VDT, on right KG preparing for transplantation on RIF (figures 1 and 3). If the graft is the left kidney, short vein due to iatrogenesis, some cases no need renal VDT, only perform dissection and prolongation (table 5).

Table 5. *Results and efficacity of the venous prolongation on the KG of group A.*

Dissection and prolongation (63 KG for group A)	Average length (cm)	range	p value
Before venous prolongation	7.36 ± 2.37	[4 to 15]	0.0000
After venous prolongation	15.76 ± 4.23	[10 to 25]	

p=0.0000 statistic significant

Table 6. *Surgical skills perform on kidney grafts and on recipients.*

Kidney Grafts				
Renal VDT	VDT (pts) Prolong only	Prolong + disposition	Without renal DVT (pts)	Total (pts)
pts	28 (13.93%)	34 (16.91%)	139 (69.15%)	201 (100.00%)
Recipients				
Iliac VDT	Iliac DVT	Without Iliac DVT (pts)	Total (pts)	
pts	46 (22.89%)	155 (77.11%)	201 (100.00%)	

(performed on 30.84% GK as venous prolongation ± renal VDT and on 22.89% recipients as iliac VDT).

There were various clinical forms of VDT in KTx.

There were various clinical forms depending on the situation, VDT can be performed (on the back table and recipient surgical table) (table 7).

1. On KG only,
2. On the recipient only,
3. On KG and recipient,
4. No need to intervene anything, classically operated.

Table 7. *The multiple clinical aspects of VDT in practice.*

Vascular Disposition Technique	**Group A (n=63)**		**Group B (n=138)**	**Total**
	Right kidney	**Left kidney**	**Left kidney**	
Renal VDT only (for veins not too short)				
Prolong only renal vein without renal VDT	6	5	0	11
Prolong and the renal VDT	5	1	0	6
Iliac VDT only (for left KG)				
Iliac VDT without renal VDT	0	1	0	1
Renal VDT combines iliac VDT (for both side if it is short ≤ 20 mm)				
Prolong renal vein+ iliac VDT (almost is right KG)	14	3	0	17
Prolong and renal VDT + iliac VDT (almost is right KG)	25	3	0	28
Regular technique (left graft on right side)				
Left renal graft, renal vein >20 mm*	0	0	138	138
Pts number	50	13	138	201
Total pts	63		138	201
% (n=201)	30.43%		69.57%	

(*) No hilar dissection nor prolong the vein neither renal VDP and iliac VDT

Follow-up (FU) time.

For both 2 groups, these pts underwent the KTx from October 27th -1998, to December 07th -2011. They were continued to manage and FU until to December 2016.

Average whole time of group A was 8.0 ± 3.4 years, also group B was 8.79 ± 4.03 years (table 8).

Table 8. *The duration of postoperative FU of the KTx from 1998-2011.*

Year 1998-2016		**Group B (n=138)**	**p value**
Group A (n=63)	8.00 ± 3.44	[2 to 18]	0.01
Group B (n=138)	8.76 ± 4.05	[0.7 to 18}	

Doppler ultrasound: Doppler ultrasound can effectively access the blood perfusion, the ultrasound test were implemented as program.

The results of ultrasound from 1998-2011 demonstrated the normal limits between 2 group. All of ultrasound tests showed normal blood perfusion. The hemodynamic index average value was not statistic significant between groups A and B.

Serum creatinine (SCr) after KTx.

FU at least 0.7 years, there aren't statistic significant between 2 groups that mean the renal function was safe with the new technique (table 9).

Note: there were a number which SCr increase, due to medical problems such as: acute and chronic allograft nephropathies, drug nephrotoxicity, (p=0.09) (table 9).

Table 9. *Follow-up time (FU) and Serum creatinine (SCr) FU.*

Post-operative FU, (average value)		**Group A (n=63)**	**Group B (n=138)**	**p value**
Doppler ultrasound control				
Resistant Index (RI)	1998-2011	0.64±0.04	0.65±0.04	0.74 *(ns)*
Renal arterial flow,	1998-2011	38.81±13.41	37.95±16.54	0.15 *(ns)*
Renal venous flow,	1998-2011	13.39±4.37	12.45±3.62	0.001 *(s)*
Resistant Index (RI)	1998-2016	0.64±0.04	0.64±0.03	*(ns)*
Renal arterial flow,	1998-2016	42.71±12.98	44.09±16.12	0.02 *(s)*
Renal venous flow,	1998-2016	17.12±6.83	16.17±6.55	0.016 *(ns)*
SCr (mg/dL),	1998-2011	1.38 ±0.94	1.61 ± 1.25	0.16 (ns)
SCr (mg/dL)	1998-2016	1.46 ± 1.03	1.71 ± 0.92	0.09 *(ns)*

After whole time: normal index of blood perfusion, no hemodynamic complication and functional complication due to poor blood perfusion. There was statistic significant of renal arterial and venous flow between group A and B, p< 0.05. But it was still in normal range and the rest of other factors were not statistic significant between of both.

The CT scan Angiography: That wasn't the routine test, due to the high cost, but that was the wonderful imaging to demonstrate the good result of VDT (Figure 5).

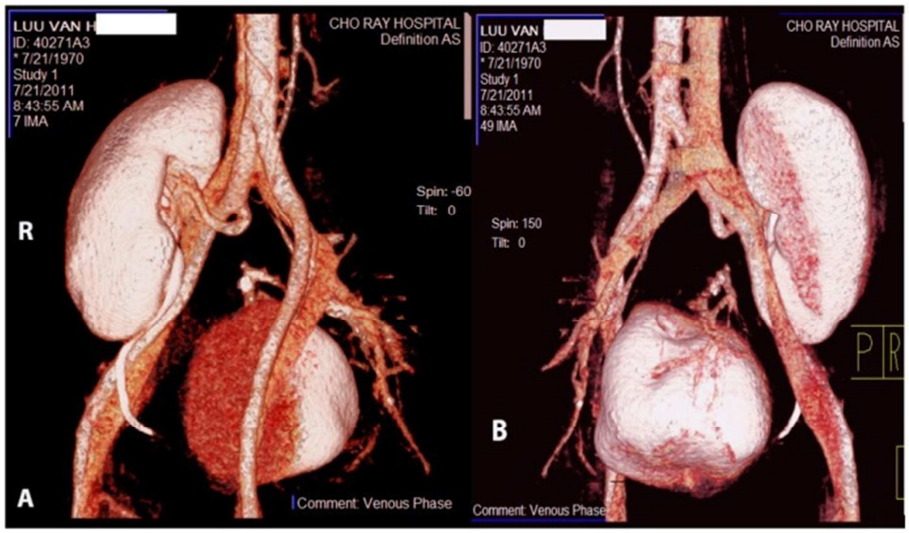

Figure 5. *A, B, C: It's demonstrated the good anastomosis and good circulation of blood).*

Surgical complications: Rate of early surgical complications of group A and B were 3.2% and 8.6% respectively, not statistic significant. There isn't any vascular surgical complication (strangulation, stretching, thrombosis, anastomotic fiber stenosis). No mortality due to surgical technique (table 10).

Table 10. *The early complications of 2 groups (n=201).*

Complications	Group A	% (n=63)	Group B	% (n=138)
Wound not healing	0	0.0	1	0.7
Wound bleeding	1	1.6	2	1.4
Vascular anastomosis bleeding	0	0.0	2	1.4
Urinary leaking	0	0.0	4	2.9
ureteral necrosis	1	1.6	2	1.4
Lymphocele	0	0.0	1	0.7
Total	2	3.2	12	8.6

p= 0.259 not statistic significant

Graft survival: The KG was dead function; the patient had returned to extrarenal epuration, we call KG death. From 1998 to 2016, there were 1/63 pts of group A (1.79%); and 24/138 of group B (17.39%), not statistically different (p>0.05). The causes of KG lost could be related to others factors such as acute rejection, allograft chronic nephropathy, nephrotoxicity due to immunosuppressive agents… (table 11).

Table 11. *Causes of KG lost of 2 groups A and B from 1998-2016: without cause due to surgical complication.*

Cause of KG lost	Group A (n=63)	Rate % (n=63)	Group B (n=138)	Rate % (n=138)	p value
Chronic allograft nephropathy	4	6.35	22	15.94	0.06
Non-adherence	1	1.59	2	1.45	
Total	5	7.94	24	17.39	0.076
% (n=201)	2.49		11.94		

Mortality: The mortality (pts lost life) for group A and B was 6/63 pts (9.52%) vs 19/138 pts (13.74%), (p= 0, 65). The most causes of death due to infection. There wasn't any relation of death to the surgical complication. All of dead causes were medical (table 12).

Table 12. *The causes of death, and mortalities after kidney transplant in 2 groups from 1998-2016.*

Reasons of death	Group A (n=63)	Rate % (n=63)	Group B (n=138)	Rate % (n=138)	p value
Strokes	1	1.59	4	2.90	
Suicide	0	0.00	1	0.72	

Reasons of death	Group A (n=63)	Rate % (n=63)	Group B (n=138)	Rate % (n=138)	p value
CMV pneumonia	0	0.00	3	2.17	
Pneumonia	5	7.94	4	2.89	
Meningitis	0	0.00	1	0.72	
Septicemia	0	0.00	2	1.45	
Anaphylactic shock	0	0.00	1	0.72	
Cancer	0	0.00	2	1.45	
Electrolyte disorders	0	0.00	1	0.72	
Total	6	9.52% (n=63)	19	13.76% (n=138)	0.39
% (n=201)	2.99% (n=201)		9.45% (n=201)		

The Kaplan-Meier diagram for graft survival rate

This diagram used the data from tables 11 and 12 (lost life and lost graft). There was a statistical significance between graft survival rate of 2 groups, but there wasn't related to surgery, all of causes of death were medical. The survival rate difference of 2 group A & B may be due to difference of immunologic criteria or medical regimen (figure 6).

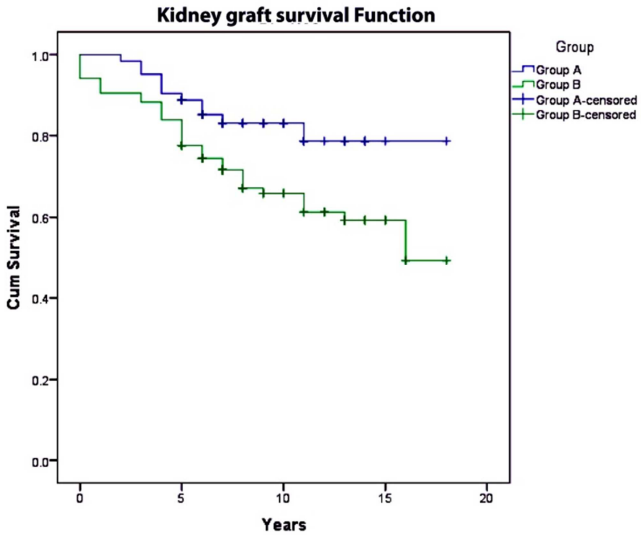

Figure 6. *Kaplan- Meier diagram graft survival of 2 groups KTx A and B.*

4. Discussions

Comments on patient characteristics

We had started the pts serial in the period we have got only open retroperitoneal nephrectomy, but we have preferred to perform the right KG on the right side of the recipient, with the vessels disposition of the IV and renal vessels.

The transperitoneal laparoscopic living-donor nephrectomy had started at 2004, and then quickly changed to retroperitoneal living-donor nephrectomy.

Comments on indication and utility of VDT in KTx

The indication of VDT is especially for the right KG with the short vein under 20 mm: use two surgical skills: the renal VDT and iliac VDT.

The surgical technique can use also for left KG with short vein. Cause of short vein on the left kidney is usually surgical, because left renal vessels is anatomically long. In this serial, we had 13/63 pts of group A (20.06% of VDT), the surgical skill is usually easier, no need a renal VDT, only venous prolongation, only perform the iliac VDT,

This indication for VDT had some utilities: avoid an angioplastic surgery, it is difficult to perform and more risky [3, 5, 6, 25, 26]. The authors reported, the complications were thrombosis 6%[21], bleeding and re-operated 30% to 60%[21], renal function [19-21]. Bollens et al. (2007) [1] was used the Endo GIA stapler to maximize the length of the renal vein in laparoscopic live donor nephrectomy. These are similar in study of Nasser Simforoosh et al [4]; they tried to get the maximization length of renal vein by their techniques, which will be increasing the donor's risky of vascular clip malfunction. Nasser Simforoosh et al [4] had 62/79 right KGs, that were removed because the left KGs have many arteries. This is not recommended because of the indication remove which kidney to donate is not the cause of technical difficulties. The best functioning kidney must leave for the donor. And the upside down of KG to the RIV of recipients (reverse the excretion of urine flow), it should not recommendation.

The reliability, safety and feasibility

According the conception of indications to nephrectomy on right side, if we need reserve the best kidney for the donor, we have to remove the right kidney [11-17]. So there was many KG with short renal veins.

Transplant surgeons faced more difficulty; but they have to accept the difficulties and have to adapt by improving the surgical technique [1-6, 22], Our VDT as a practical solution.

Table 9 shows the normal index of blood perfusion. There was not statistic significant between group A and group B, $p > 0.05$. So the VDT could be ensured the hemodynamic circulation as normal.

This study were homogeneous because there was only one surgical team performed the research, and FU for long-term, during nearly 9 year of average, so it reliability.

With these serial cases, we don't fail, and don't have to change to other technique. So it is easy to perform. Naturally, it needs some vascular surgical skills in KTx. Figures 7, 8 shows the DVT on recipient and KG). There weren't vascular complication.

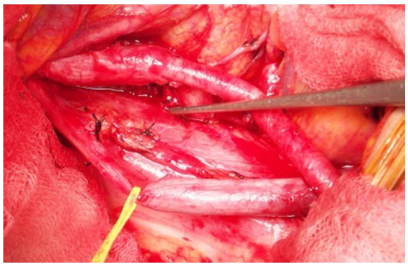

Figure 7. *The iliac vessal dissection, ligate and cut venous branches; remove it to the right.*

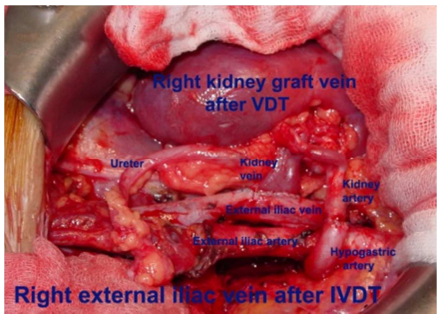

Figure 8. *Right KG and external IV after VDT. It has not stretched or blocked the component of kidney hilum.*

Comment on References to Other Authors

Until recently, we approached to information from literature about authors who also had ideas. In order to better reach the experience on vessel disposition in KTx, we could saw the difference of 4 authors on table 13 [4, 7, 8].

About the term "transposition", the first time we use this therm. After discuss with an author from Sydney University [21] we thought the term "transposition" mean "removing from somewhere to somewhere"; other hand, the term "disposition" mean "arrangement" so we prefer it, "vessel disposition technique".

Table 13. *A reference summary from other authors from literature with our serial.*

Authors	**Ciudin, musquera, huguet et al [9]**	**Molmenti, varkarakis et al [10]**	**Nasser Simforoosh et al [4]**	**DU, TRAN et al**
	Hospital Clinic of Barcelona, Spain	**Johns Hopkins University, USA**	**The Shahid Labbafinejad Medical Center**	**Cho Ray Hospital, VN**
Methods	Prospectively collected data (Case study)	Case study	Prospective and long-term FU	Prospective with group control
Surgical technique	Vessel transposition	Iliac Vein Transposition	try to get max the length of renal vein and upside down to the RIV of recipients*	Vessel Disposition
Details of surgical technique				
Side of KTx	Left or Right side	Does not defined right or left side	Right side to right side	Right or left side
Perform on recipient	Iliac vein	External Iliac vein (±) Internal Iliac vein	inversion of the right donor kidney no need of any further procedures for the RIV,	- External Iliac vein + Internal Iliac vein - External Iliac artery (±) Internal Iliac artery
Perform on renal graft	- No intervention	- No intervention	- No intervention	Renal VDT on the right renal graft
Year of study	2004-2010	Nov 2004	March 2004-Nov. 2009	1998-2016
No of case	43 cases	6 cases	79 cases	63 cases
Donors	LD	4 LD 1 DC 1 auto-transplantation	LD	LD
Graft removing by	- Laparoscopic LD nephrectomy (hand assisted)	-Laparoscopic LD nephrectomy -Open cadaveric Nephrectomy	Transperitoneal laparoscopic LD nephrectomy	- Open LD retroperitoneal Nephrectomy -Transperitoneal laparoscopic LD nephrectomy -Retroperitoneal laparoscopic LD nephrectomy
Postoperative follow-up				
SCr level (mg/dL)	1.5	1.7	1.46 (0.81-6.19)	1.46 ± 1.03
Hemodynamic control	Doppler ultrasound	Undefined	Doppler ultrasound	Doppler ultrasound
Surgical complication	No surgical complication	No long-term vascular complication	No short term / long-term vascular complication	No short term / long-term vascular complication
FU time	2004-2010 (6ys)	Undefined	2004-2009 (5ys)	9.00 ± 4.0 ys 1998-2016

* try to get max the length of renal vein (increase risky for donor) and upside down to the RIV of recipients (reverse the excretion of urine flow)

5. Conclusions

During long time, at least 0.7 year FU from 1998 to 2016, our VD procedure for short vein of KG was satisfactory. The VD procedure includes 3 factors: (1) with the anatomical structure advantages of the RIF such as: The RIV has askew advantage over the LIV of the recipient and shallower than the left; the RIF have empty space and not covered by sigma colon. So the surgeon will prefer to select the RIF than the LIF for kidney transplantation and if the kidney biopsy has needed, it will also reduce complications than the LIF. To have the advantage of vessels anastomosis technique and treatment of urological complications, Surgeons are common to choose the RIF for the left KG and the LIF for the right KG (after plastic surgery to prolong the right graft vein). In

this research, we could perform KTx on the right side of the patient, for left KG and also for right KG. (2) For the short renal vein, we could prolong it by hilar dissection, and perform our surgical skill call renal vessel disposition. The hope, our experience may inform to surgeon will no longer be reluctant to confront the right KG. (3) With the average FU time is nearly 9 year; Doppler ultrasound is the first test to use to detect the vessel complications after kidney transplantation. There was not statistic significant about hemodynamic complication and functional complication due to poor blood perfusion between group A and group B, $p > 0.05$. So the VDT is the safety technique and it could replace the any KG vein plastic surgery techniques.

List of Abbreviation

CAPD:	continuous ambulatory peritoneal dialysis
ESRD:	end-stage renal disease
FU:	Follow-up
HD:	hemodialysis
IV:	Iliac vessel
IVD:	iliac vessel dissection
KG:	Kidney Graft
KTx:	Kidney transplantation
LIF:	Left iliac fossa Pts: Patients
RIA:	Right iliac arteries
RIF:	Right Iliac Fossa
RIV:	Right iliac vessels
SCr:	Serum creatinine
VD:	Vascular diposition
VDT:	vessel disposition technique

References

[1] Bollens, R., et al., Laparoscopic Live Donor Right Nephrectomy: A New Technique to Maximize the Length of the Renal Vein Using a Modified Endo GIA Stapler. european urology, 2007. 51: p. 1326-1331.

[2] Ei-Hinnawi, Ashraf; Sageshima Junichiro; Uchida, Koishiro; Chen, Linda; Burke, George W.; Ciancio, Gaetano, New Technique in Using the Gonadal Vein in Lengthening the Right Renal Vein in Living Donor Kidney Transplant, Transplantation Journal, 2012. 94 (6): p. e40-e41.

[3] Naderi, G. H., et al., Polytetrafluoroethylene Vascular Graft as a Rescuer of Short Renal Vessels During Kidney Transplantation. Urol. J, 2009. 6: p. 91111-47.

[4] Nasser Simforoosh, Ali Tabibi, Mohammad Hossein Soltani, Samad Zare, Seyed Reza Yahyazadeh, Behrang Abadpoor, Long-Term Follow-up After Right Laparoscopic Donor Nephrectomy and Inverted Kidney Transplant. Experimental and Clinical Transplantation, 2016, 14 (1), p. 27-31.

[5] Nghiem, D. D., Spiral Gonadal Vein Graft Extension Of Right Renal Vein In Living Renal Transplantation. The Journal of Urology 1989: p. 1525.

[6] Nghiem, D. D., Use of spiral vein graft in living donor renal transplantation. Clin Transplant, 2008. 22 (6): p. 719-21.

[7] Puche-Sanz, I., et al., Right renal vein extension with cryopreserved external iliac artery allografts in living-donor kidney transplantations, in Urology. 2013. p. 1440-3.

[8] Veeramani, M., et al., Donor Gonadal Vein Reconstruction for Extension of The Transected Renal Vessels in Living Renal Transplantation. Indian J Urol, 2010. 26 (2): p. 314-316.

[9] Ciudin, A., et al., Transposition of Iliac Vessels in Implantation of Right Living Donor Kidneys. Transplantation Proceedings, 2012. 44: p. 2945–2948.

[10] Molmenti, E. P., et al., Renal transplantation with iliac vein transposition. Transplant Proc, 2004. 36 (9): p. 2643-5.

[11] Thu, D. T. N., et al., The Transposition technique of blood vessels in kidney transplantation. 2009. p. 84.

[12] Tran, N. S., et al., Right Iliac Vein Positioning in Right Renal Grafts 2009. p. S221.

[13] Du, T., et al., A Procedure To Transplant a Kidney with Short Vein Removing by Laparoscopy. 2011: Elsivier's publisher. p. s352.

[14] Sinh Ngoc Tran, T. T. N. D., Venous Disposition Procedure (VDP) of The Right Renal Vein After Laparoscopic Donor Nephrectomy -A Simple Procedure. 2011: Glasgow Scotland.

[15] Tran Ngoc Sinh, D. T. N. T. e. a., A Vascular Disposition Technique For Short Vein Of Graft In Kidney Transplantation. 2012, International Journal of Urology.

[16] Thu, D. T. N., Evaluate The Vascular Disposition Procedure in Kidney Transplantation from living donor into right iliac fossa. (Đánh giá kỹ thuật chuyển vị mạch máu trong ghép thận từ người cho sống vào hốc chậu phải), in AMBN support for Education and Training. 2012, Ho Chi Minh City Medical and Pharmacy University.

[17] Thu, D. T. N. and T. N. Sinh, Đánh Giá Kỹ Thuật Chuyển Vị Mạch Máu Trong Ghép Thận Từ Người Cho Sống Vào Hốc Chậu Phải. (To evaluate the vascular disposition procedure in kidney transplantation from living donors and right iliac fossa). Ho Chi Minh City Medical Research, 2013. 17 (3): p. 44-50.

[18] Piyasena, R. and U. Hamper, Doppler ultrasound evaluation of renal transplants. Radiology Journals, 2010. 39 (9): p. 24-32.

[19] Tublin, M. E., R. O. Bude, and J. F. Platt, Review. The resistive index in renal Doppler sonography: where do we stand? AJR Am J Roentgenol, 2003. 180 (4): p. 885-92.

[20] Colleen, M., Noninvasive Vascular Examination. Springer Science + Bussiness Media, 2006: p. 19-24.

[21] Allen, R. D. M., Vascular Complications After Kidney Transplantation. 6th ed. Kidney Transplantation Principles and Practice, ed. P. e. J. M. John M. Barry. 2008: Saunders W. B. Company.

[22] Aktas, S., et al., Analysis of vascular complications after renal transplantation. Transplant Proc, 2011. 43 (2): p. 557-61.

[23] Park, S. B., J. K. Kim, and K. S. Cho, Complications of Renal Transplantation Ultrasonographic Evaluation. J Ultrasound Med, 2007. 26: p. 615-633.

[24] John M. Barry, P. J. M., Surgical techniques of renal transplantation. 6th ed. Kidney transplantation Principles and Practice, ed. S. J. K. Peter J Morris. 2008: Saunders W. B.

[25] Giuseppe Serena, Javier Gonzalez, Giselle Guerra, Mohamed Ammar AlNuss, Maykel Valdes, and Gaetano Ciancio, Vascular Reconstructions in Living Unrelated Kidney Transplant Using Donor Ovarian Vein and Recipient Inferior Epigastric Artery with Simultaneous Enucleation of a Complex Cyst, Hindawi, case report in transplantation, 2019, Article ID 3272080, https://www.hindawi.com/journals/crit/2019/3272080/

[26] Cho S., Cho W., Cho M-. J., Choi C., Ahn S., Min S-. I., Min S-. K., Kim S., Ha J. Artificial Graft Extension of Renal Vein in Living Kidney Transplantation, Am J Transplant. 2017; 17 (suppl 3).